tropic support ($p<0.01$).

Conclusion: HFABP is a rapid marker for assessment of myocardial damage and clinical outcome in pediatric cardiac surgery. In particular, serum HFABP levels immediately after an aortic declamping may be a potentially useful prognostic indicator of myocardial damage as well as clinical outcome in pediatric cardiac surgery.

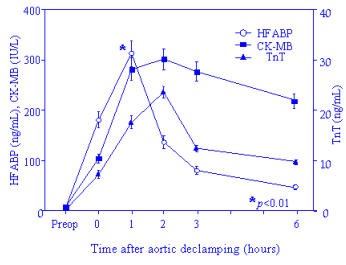


Fig 1

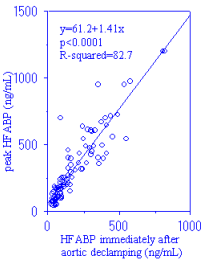


Fig 2

1039-205 **Partial Anomalous Pulmonary Venous Connection: Warden Versus Non-Warden in a Contemporaneous Surgical Cohort**

Camille L. Hancock Friesen, Andrea Schnell, Kimberlee Gauvreau, Pedro J. del Nido, Joseph M. Forbess, Richard A. Jonas, John E. Mayer, Jr., J. Keane, Michael F. Flanagan, Emile Bacha, Children's Hospital Boston, Boston, MA

Background: The Warden procedure for repair of right-sided partial anomalous pulmonary venous connection (PAPVC) comprises dividing the SVC above the anomalous pulmonary veins, over sewing the proximal SVC stump, anastomosis of the distal SVC to the right atrial appendage and baffling of the pulmonary veins to the interatrial communication. We reviewed our operative series to compare the incidence systemic venous obstruction, pulmonary venous obstruction and sinus node dysfunction (as indicated by 12 lead EKG at most recent follow up) in patients with right-sided PAPVC undergoing the Warden procedure (W) versus a traditional baffle operation (B).
Methods: We reviewed all available data for 92 pts with right-sided PAPVC who were operatively repaired in a single institution 01/88-12/00. The W technique was used when one of the anomalous RPV entered the SVC cephalad to the SVC-RA junction such that using a standard B repair would entail a long and potentially obstructing baffle.
Results: Thirty-eight pts were repaired using the W procedure, 54 had traditional B operations (39 had isolated baffle, 15 had baffle plus SVC-RA junction augmentation). Eighteen pts had additional procedures. Males comprised 68.4% of the W and 46.3% of B pts, p=0.06. Both pt cohorts were similar in age (W median 4y vs B 3y, p=0.06) and weight at surgery (W median 14.3 kg vs B 15 kg, p=0.09). The total pump and cross clamp times were similar between the groups. There were no early or late mortalities. W pts had a shorter median length of stay in hospital (4 d vs 5 d, p=0.008). There was a higher incidence of asymptomatic SVC obstruction in W pts compared with B pts (18.4% vs 3.7%, p=0.03) with a trend to increased reintervention (2/3 were symptomatic) in the W cohort (7.9% vs 0, p=0.07). Reintervention in 2 pts was single balloon dilation and 1 pt required reoperation. Pulmonary vein obstruction occurred in 1/38 W vs 5/66 B pts, p=0.4, with one pt in each group requiring reintervention. Non sinus rhythm was rare (W 1/38, B 0/54) with no patients requiring a pacemaker although the study is underpowered to detect a difference.
Conclusions: The W procedure is associated with a higher risk of asymptomatic SVC obstruction than the B approach.

1039-206 **Determinants of Intensive Care Unit Length of Stay for Infants Undergoing Cardiac Surgery**

Matthew J. Gillespie, Marijn Kuijpers, Maaike Van Rossem, Sarah Tabbutt, J. William Gaynor, Thomas L. Spray, Bernard J. Clark, III, The Children's Hospital of Philadelphia, Philadelphia, PA

Background: To better understand the determinants of medical cost in infants undergoing cardiac surgery we determined factors that influence postoperative intensive care unit length of stay (ICLOS).
Methods: Records of infants < 6 months of age at time of surgery from 1/2000-12/2000 were reviewed. Diagnostic and surgical severity were adjusted using the Aristotle Basic Complexity Score (ABCS; range 1-4).
Results: Of 223 infants, 68 had elective surgery, ie admission to the CICU after surgery and 155 had non-elective surgery with admission to the CICU preoperatively. Elective vs non-elective groups differed: ABCS(median 2 vs 3, p<0.001), age at surgery (mean 110 ±10.5 vs 27±3.7days, p<0.001), Total LOS (median 5 vs 10 days, p<0.001) ICLOS (median 3 vs 5.5 days, p<0.002) and mortality (1.5% vs 14.5% p<.0001). Step wise multiple regression was performed using the natural log of ICLOS as the dependent variable (R^2 range .66-.76). Factors associated with longer ICLOS included: higher ABCS, total hours of ventilatory support, total support time (TST = bypass + circulatory arrest times), postop cardiac catheterization, postop necrotizing enterocolitis and postop NG feeds. Higher preop weight and surgical repair vs palliation decreased ICLOS.
Conclusion: Operative and postop factors influenced ICLOS more than factors related to preop clinical condition. The ABCS provided an efficient method of severity adjustment for diagnosis and surgical procedures. The ABCS was significantly correlated with ICLOS.

Variable	Coefficient	t value	p value
postop cath	0.996	5.983	0.000
Mech vent time	0.001	5.575	0.000
total support time	0.003	2.702	0.008
Complexity Score	0.111	1.939	0.05
preop weight	-0.082	-2.472	0.014
postop NG feeds	0.369	3.969	0.000
postop NEC	0.826	4.07	0.000
surgical repair	-0.171	-2.033	0.043

POSTER SESSION

1057 Fetal Cardiology

Sunday, March 07, 2004, 3:00 p.m.-5:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 3:00 p.m.-4:00 p.m.

1057-199 **Characteristics and Outcomes of Fetuses With Pericardial Effusions**

Timothy C. Slesnick, Nancy A. Ayres, Carolyn A. Altman, Louis I. Bezold, Benjamin W. Eidem, J. Kennard Fraley, Grace C. Kung, John P. Kovalchin, Baylor College of Medicine, Houston, TX

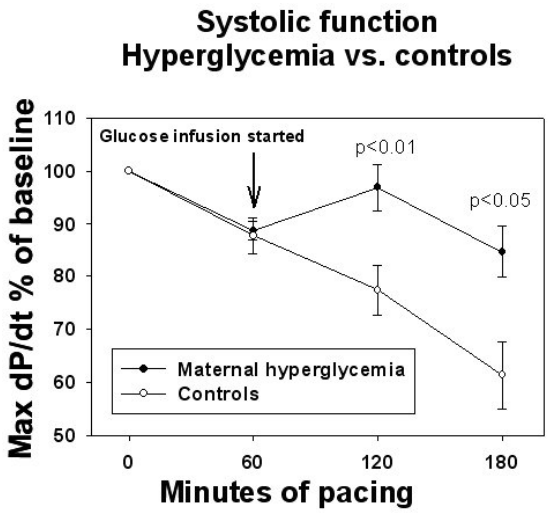
BACKGROUND: Limited information is known about the characteristics and outcomes of fetuses with pericardial effusions (PCE). We sought to identify factors associated with fetal PCE, the natural history, and outcomes of fetuses with PCE.
METHODS: We reviewed our fetal echocardiography database from 1993 to 2002, and all pts with PCE were included in the study. Size of PCE, presence of structural heart disease, hydrops, cardiac function, arrhythmias, and extracardiac malformations were determined for each pt. Pts were divided into small (<4 mm) and large (≥4 mm) PCE groups for comparison. Follow-up and outcome data were evaluated, and comparisons were made between survivors and nonsurvivors.
RESULTS: PCE were present in 104 fetuses (mean gestational age 28.6 ± 5.0 weeks), including 80 small and 24 large PCE. Forty-seven pts had structural heart disease, 37 hydrops, 29 impaired cardiac function, 26 arrhythmias, and 14 extracardiac malformations. Twenty pts had PCE without any other fetal abnormalities (isolated), including 19 small and 1 large PCE. Large PCE were associated with a higher likelihood of structural heart disease (p=0.03) and impaired function (p=0.01), but not with hydrops, arrhythmias or extracardiac malformations. Repeat fetal echos were performed in 52 pts, with resolution of PCE in 25 pts (48%), 23 small and 2 large. Postnatal echos were performed in 45 pts, with resolution of PCE in 41 pts (91%), 30 small and 11 large. Only 4 of these pts had postnatal PCE, all of whom had large fetal PCE. Outcome data were available for 83 pts (80%), with 26 total deaths. PCE with hydrops (p=0.05) or extracardiac malformations (p=0.001) were associated with death. However, PCE size, structural heart disease, cardiac function, and arrhythmias were not associated with death. Isolated PCE was associated with survival (p=0.03).
CONCLUSIONS: Large PCE in fetuses are associated with structural heart disease and impaired cardiac function, though large PCE are not associated with death. Additionally, fetuses with PCE in the presence of hydrops or extracardiac malformations have a high risk of mortality. The majority of fetal PCE resolve, and fetuses with isolated PCE have a very good prognosis.

1057-200 **Maternal Hyperglycemia Acutely Improves Fetal Cardiac Function During Tachycardia-Induced Heart Failure**

Michael R. Schmidt, Morten Smerup, Steen Kristiansen, Paul White, Keld Sorensen, Andrew Redington, Vibeke Hjortdal, Aarhus University Hospital, Skejby, Aarhus, Denmark, Hospital for Sick Children, Toronto, Canada

Introduction: Sustained fetal tachycardia may lead to cardiac failure, hydrops, and intrauterine death. We have previously shown that glucose-insulin infusion improves fetal cardiac function during tachycardia. Maternal hyperglycemia induces fetal hyperinsulinemia and may be a therapeutic strategy.
Hypothesis: We hypothesized that cardiac function during fetal tachycardia can be improved by induced maternal hyperglycemia.
Methods: 7 control fetuses and 5 hyperglycemia (HG) fetuses (all 7-10 days preterm) from 6 pregnant sows were studied. LV pressure was measured using a 1.4F high fidelity pressure catheter positioned in the LV via the left carotid artery. Systolic function was measured as dP/dt_{max}. Fetal pacing was established with a1F pace catheter placed in the RV through the left internal jugular vein. Fetuses were paced at 300 ± 30 bpm for 3 hours. During investigation of control fetuses, sows received saline infusion. In HG fetuses, maternal 20% glucose infusion was initiated after 1 hour and maternal blood glucose clamped at 15±1 mmol/l.
Results: Figure. dP/dt_{max}declined during the first 60 min. In the control group, dP/dt_{max} continued declining to 815±302 mmHg/s at 120 min and 660±299 mmHg/s at 180 min. In contrast, systolic function improved after maternal hyperglycemia was induced in the HG

group; dP/dt_{max} was 999±253 mmHg/s at 120 min (p=0.016) and 854±209 mmHg/s at 180 min (p=0.054).
Conclusion: Induced maternal hyperglycemia improves fetal cardiac function during fetal tachycardia.



1057-201 Fetal Aortic Stenosis With Apex-Forming Left Ventricle at Time of Diagnosis: Determinants of Biventricular Repair

Masaki Nii, Rajiv Chaturvedi, Kevin Roman, Edgar T. Jaeggi, The Hospital for Sick Children, Toronto, Canada

Background: Aortic stenosis (AS) may result in impaired and preserved growth of the left heart. Potential for biventricular repair is critical in counseling and management.
Objectives: To assess the value of markers in predicting suitability for biventricular (BV) versus single ventricular (SV) repair in fetal AS.
Methods: Review of all cases of fetal AS, diagnosed at our center since 1995. Inclusion criteria were 1) apex-forming left ventricle (LV) at time of diagnosis, 2) intact ventricular septum, and 3) serial follow-up studies to birth. The following parameters were assessed at diagnosis: Ventricular dimensions and systolic functions, orientation of aortic and foraminal flows, and presence/absence of endocardial fibroelastosis. Analysis of the pulmonary venous flow to assess diastolic function included peak velocity of reversed flow during atrial systole (PVA), integrated time velocity ratio of early diastolic to ventricular systolic forward flow (D/S), and the ratio of reversed to forward pulmonary venous flow (A/(S+D)). Depending on the type of postnatal intervention, 2 patient groups were created and the parameters compared.
Results. The baseline characteristics of 16 fetuses included in the study are shown.

	SV Repair (n = 8)	BV Repair (n = 8)	P-Values
Age at diagnosis	21.4±4.3 weeks	21.8± 5.7 weeks	NS
Increase in LV diameter	5/8 (63%)	4/8 (50%)	NS
Endocardial fibroelastosis	7/8 (88%)	4/8 (50%)	NS
LV shortening fraction	4.0±8.1 %	18.2±17.8 %	0.04
Retrograde aortic flow	3/8 (38%)	0/8 (0%)	NS
Left-right atrial shunting	8/8 (100%)	5/8 (63%)	NS
PVA reversal	35.4±9.8 cm/s	10.1±0.5 cm/s	0.0001
D/S TVI	0.3±0.3	1.1±0.5	0.007
A/(S+D) TVI	0.52±0.24	0.09±0.07	0.003

Conclusion: In AS with apex-forming LV at time of diagnosis functional indices (LV shortening; pulmonary vein flow) provide useful information in predicting left ventricular growth potential and suitability for biventricular repair.

1057-202 Changing Indications for Fetal Echocardiography in a University Center Population

Mark K. Friedberg, Norman H. Silverman, Stanford University, Stanford, CA

Background
Technical advances and obstetrical education have greatly increased the use of Fetal Echocardiography (FE) over the past 10 years. Earlier studies showed that the major indications for FE included a family history of congenital heart disease (CHD), maternal diabetes and arrythmia. We hypothesized that the increased utilization of FE is associated with a change in indications and yield of FE.
Methods
We reviewed 300 consecutive FE performed at Stanford University between 12/2002 and 8/2003. Major anomaly was defined as that affecting prognosis.
Chromosomal anomaly was defined either as suspected (based on ultrasound (US) findings) or proven (chromosomal analysis).
Results
Indications for FE and their yield are presented in the table.

Indication	No. of FE	% of FE	No. of Major anomalies	No. of Minor anomalies	Yield (%)
Family history of CHD*	68	23	1	2	4
Maternal diabetes	55	18	2	2	7
Abnormal obstetrical US (Suspicious for CHD)	46	15	15	1	35
Arrythmia	35	12	2	3	14
Extracardiac congenital anomalies	29	9	3	0	10
SLE/ +SSA/SSB	21	7	1	2	14
Chromosomal anomaly	18	6	5	4	50
Teratogen Exposure	14	5	0	0	0
Other	9	3	4	1	5
Advanced maternal age	4	1	0	0	0
Not ascertained	1	0.3	0	0	0
Total	300	99.3	33	15	16

Mean maternal age was 31±6 (range 16-44) years. Of 7 cases with increased nuchal thickening, 1 (14%), showed PA/IVS. No cardiac anomalies were found in the presence of an abnormal umbilical cord.
Conclusions
Indications for FE have changed over the last 10 years. An obstetrical US suspicious for CHD has become a prominent indication for FE, indicating an increased awareness of cardiac anomalies by obstetricians. This indication, together with chromosomal anomalies, accounts for a large percentage of positive FE. Thus, the yield of FE depends to a large extent on the skills of the obstetrician. Common indications that continue to have relatively low yield include maternal diabetes, arrhythmia and especially a family history of CHD and exposure to a teratogen.

1057-203 Ventricular Function in Fetal Congestive Heart Failure and Predictors of Perinatal Outcome

Masaki Nii, Mary van der Velde, Edward N. Marcus, Wendy Tsang, Lisa K. Hornberger, The Hospital for Sick Children, Toronto, ON, Canada, Children's Hospital, Boston, MA

Background: Although the types of primary cardiac lesions associated with fetal congestive heart failure (CHF) are well recognized, there is a paucity of data which defines the associated abnormalities of ventricular function and predictors of outcome. We sought to determine the specific abnormalities of ventricular function and to identify ventricular functional parameters that may assist in predicting outcome in a large cohort of affected fetuses. **Methods:** We reviewed the initial fetal echocardiograms (mean age 25.2±5.2 weeks) and clinical histories of 87 fetuses with CHF due to structural heart disease (n=41), primary dysrhythmias (n=22) or primary myocardial disease (n=24). LV and RV shortening fraction (SF), and Tei indices were assessed where possible and compared to previously published normal data. Diastolic dysfunction was considered to be present when 1 or more of the following indices were abnormal: A/E ratio, deceleration time, LV-IVRT, IVC, DV and UV flow pattern. In continued pregnancies with known outcome, parameters were compared between those with fetal or neonatal demise (n=38) versus survivors (n=26). **Results:** In the 87 cases of CHF, LV and RV SF were abnormal in 49.4% and 64.9%, respectively and significantly decreased compared to normal (LV=27.4±11.7, RV=23.8±11.8,p<0.05). LV and RV Tei-indices were abnormal in 53.1% and 58.8%, respectively and overall were significantly increased (LV=0.64±0.42, p<0.01; RV=0.65±0.45, p<0.01). RV SF was significantly lower than the LV (p=0.02) but the RV and LV Tei-indices were not different. A/E ratio of both ventricles did not differ significantly from normal (LV=1.31±0.48, RV=1.46±0.62), and RV and LV A/E ratios were not different. Diastolic dysfunction was present in 39 of 50 cases with CHF assessed. Of all the functional parameters compared, only LV SF was significantly decreased in fetuses with fetal or neonatal demise versus survivors (28.4±10.5 vs 21.5±12.3, respectively, p=0.03). **Conclusion:** In fetuses with CHF, RV and LV systolic dysfunction is present in 50-60% and diastolic dysfunction in 78%. While RV systolic dysfunction is more common in CHF, the presence of LV systolic dysfunction may further contribute to outcome.

1057-204 Outcome Following Prenatal Identification of Structural Heart Disease: A Seven-Year Experience

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Background: This study evaluates outcome in a series of consecutive patients who were diagnosed prenatally with structural heart defects (SHD) and identifies factors associated with mortality in this cohort.
Methods: Fetal echo reports at a single institution from August 1995 through November 2002 were reviewed. The following outcomes for fetuses with SHD were evaluated: families opting for no active management, hospital survival following surgery at initial admission, and survival at most recent follow up. Variables evaluated for potential association with these outcomes included cardiac diagnosis, gestational age at diagnosis and at birth, gender, birth weight, extracardiac and/or chromosomal anomalies, ethnicity, insurance status (a marker of socioeconomic status), surgery at initial admission, and univentricular versus biventricular management pathway. Univariate and multivariate analysis were performed.
Results: We identified 168 fetuses with SHD, of whom 126 (75%) chose active treatment.